

**GROUNDWATER MONITORING WELL INSTALLATION  
NEVADA GOLDFIELDS LANDFILL IWP-242  
MCCORMICK COUNTY, SOUTH CAROLINA**

Prepared for:

**NEVADA GOLDFIELDS, INC.  
Post Office Box 1510  
McCormick, South Carolina 29835**

Prepared by:

**STEFFEN ROBERTSON AND KIRSTEN (U.S.), INC.  
400 Northeast Drive, Suite A  
Columbia, South Carolina 29203**

**SRK Project No. 14107  
January 1992**



**STEFFEN ROBERTSON AND KIRSTEN**  
Consulting Engineers and Scientists

January 16, 1992  
SRK Job No. 14107

Nevada Goldfields, Inc.  
Post Office Box 1510  
McCormick, South Carolina 29835

Attention: Mr. Rick Dye

**RE: GROUNDWATER MONITORING WELL INSTALLATION  
NEVADA GOLDFIELDS LANDFILL IWP-242  
MCCORMICK COUNTY, SOUTH CAROLINA**

Dear Mr. Dye:

As authorized by your acceptance of our Proposal No. 1366 dated November 1991, Steffen Robertson and Kirsten (U.S.), Inc. (SRK) has completed the installation of the additional groundwater monitoring wells at the referenced site. This report describes the work performed and presents the results obtained, along with our comments and recommendations.

We appreciate the opportunity to provide our professional services during this phase of the project. Please contact us if you have any questions or comments concerning this report.

Sincerely,

**STEFFEN ROBERTSON AND KIRSTEN (U.S.), INC.**

Joseph R. Grant, P.G.  
Project Manager

James R. Nehez, III, P.E.  
Senior Engineer/Branch Manager

enclosure

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CONTENTS

1.0	PROJECT INFORMATION . . . . .	1
2.0	FIELD EXPLORATION . . . . .	2
2.1	Soil Test Borings . . . . .	2
2.2	Monitoring Well Installation . . . . .	3
3.0	Conclusion . . . . .	4

FIGURES

- FIGURE 1     Site Map
- FIGURE 2     Monitoring Well Locations

## 1.0 PROJECT INFORMATION

The project site is located approximately 2.5 miles south of the town of McCormick, South Carolina, and about 4 miles northeast of the South Carolina-Georgia border (Figure 1). The site is a mine and process facility which has been operating since January 1991.

Elevations in the project area range from 350 to 500-feet above sea level, and the general drainage is to the southwest into the Clarks Hill Reservoir.

The four groundwater monitoring wells were installed in the saprolite aquifer at the request of the State's regulatory agency overseeing the permitting process. No sampling or chemical analyses were included in this phase of the project.

## 2.0 FIELD EXPLORATION

On the morning of January 6, 1992, Steffen Robertson and Kirsten (U.S.), Inc. (SRK) and the drilling contractor mobilized their equipment to the site. The boring locations were selected by a representative of the Nevada Goldfields group and the site topography of the area (Figure 2). The borings were designated Wells L, M, N, and O. A South Carolina Registered Surveyor will locate the borings/wells and determine the elevation of each completed well.

### 2.1 Soil Test Borings

The four soil test borings were drilled using a truck-mounted drill rig employing hollow stem augers to advance the boreholes. Soil samples and penetration resistance were measured every five feet in general accordance with ASTM D-1586. This was done using a standard two inch split tube sampler.

Representative portions of the soil samples were classified by a geologist in the field. The sampling was discontinued after the installation of wells N and O when the field representative was informed that additional subsurface data was not necessary. Generally the borings encountered a red-orange silty clay of saprolitic origin to depths of approximately 4 to 6 feet below the surface. The returns from below this depth were powdered by the drilling technique but appeared to consist of material from a sericite schistosis rock. With the exception of slight changes in color and quartz content this material extended to the borings termination depth at approximately 25 feet below the surface. Test Boring Records showing soil descriptions and penetration resistances are included in the Appendix. In addition, the soil samples were field analyzed using a photoionization detector to indicate the relative amounts of volatile organics in the soil.

The above descriptions provide a general summary of the subsurface conditions encountered. The Test Boring Records in the Appendix contain detailed information recorded at each boring location. These records represent our interpretation of the field logs based on the examination of the samples by a geologist. The lines designating the interfaces between various strata represent approximate boundaries and the transition between strata may be gradual. In accordance with SRK's standard operating procedures and QA/QC plan, all down hole drilling and testing equipment was decontaminated prior to drilling each boring.

## 2.2 Monitoring Well Installation

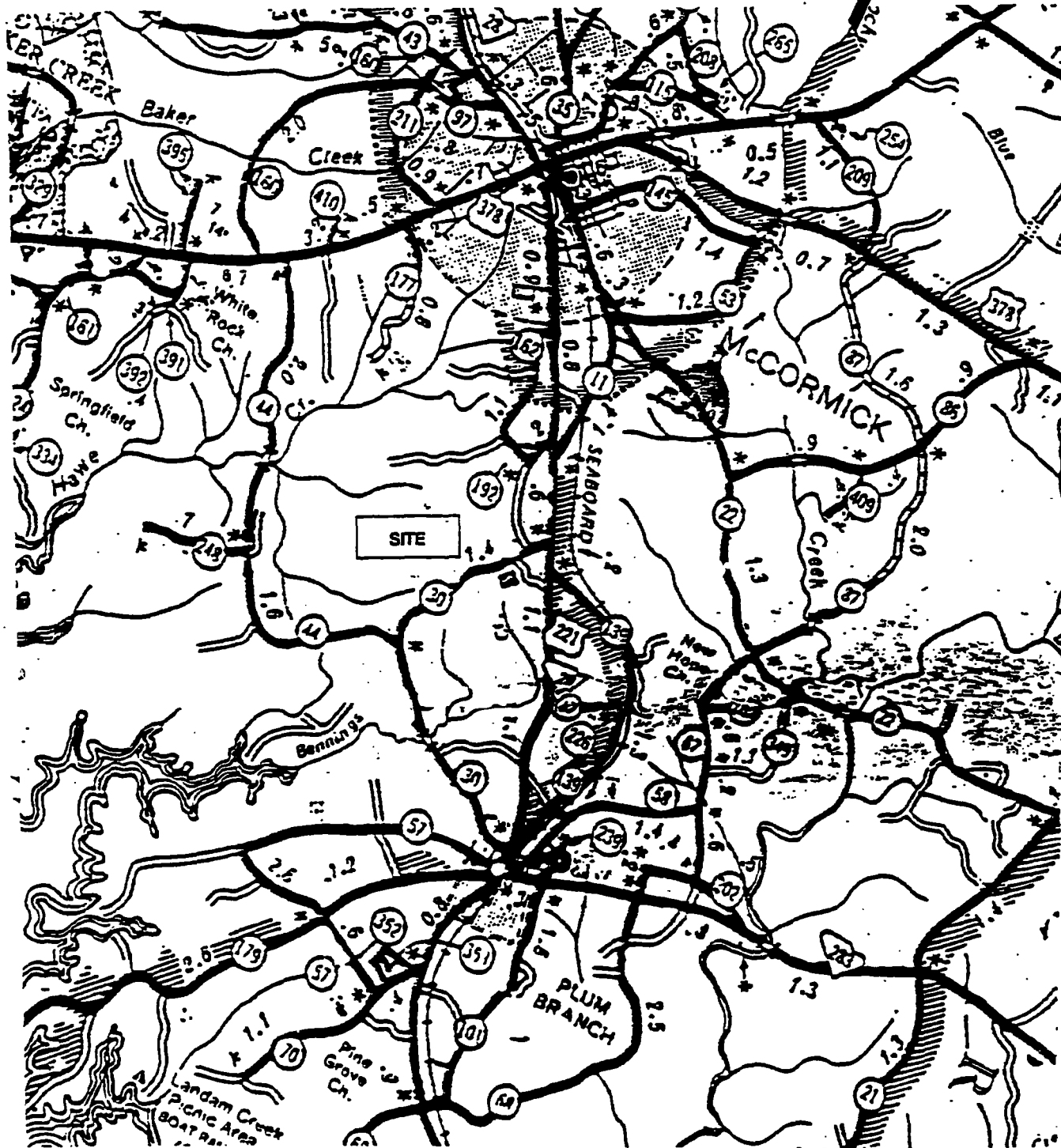
Four groundwater wells were installed in the boreholes resulting from the subsurface exploration. The well locations for wells L, M, N, and O are shown on the attached Site Plan (Figure 2).

The wells consisted of two inch diameter, Schedule 40 PVC pipe with flush-threaded joints inserted into an eight inch diameter augured borehole. The bottom ten foot section of each well consisted of manufactured well screen with 0.010-inch slots. The screen was placed so that at the time of drilling, the water level was within the upper half of the screen. Washed sand backfill was placed around the outside of the pipe to approximately two feet above the top of the well screen. The sand backfill was used to stabilize the formation and to help yield a less turbid groundwater sample. A 15-inch thick bentonite seal was installed on top of the sand backfill to seal the monitoring well at the desired level. A small amount of water was introduced into each well at the time of construction to expand the bentonite. The remainder of the borehole was then grouted with a cement/bentonite mixture. The wells were secured with locking caps inside a steel security well cover.

The monitoring well installation records included in the Appendix illustrate the construction details for each well.

### 3.0 Conclusion

The objective of the project was the installation of four monitoring wells to specified depths of 25-feet at specified locations around the waste containment structure and pond being constructed. This objective has been achieved. However, it was noted that groundwater levels in the area are in excess of 70-feet below the surface. The borings did not encounter groundwater at the time of drilling and when checked for groundwater at a later date (January 14, 1992) only well N had any water present.



SCALE



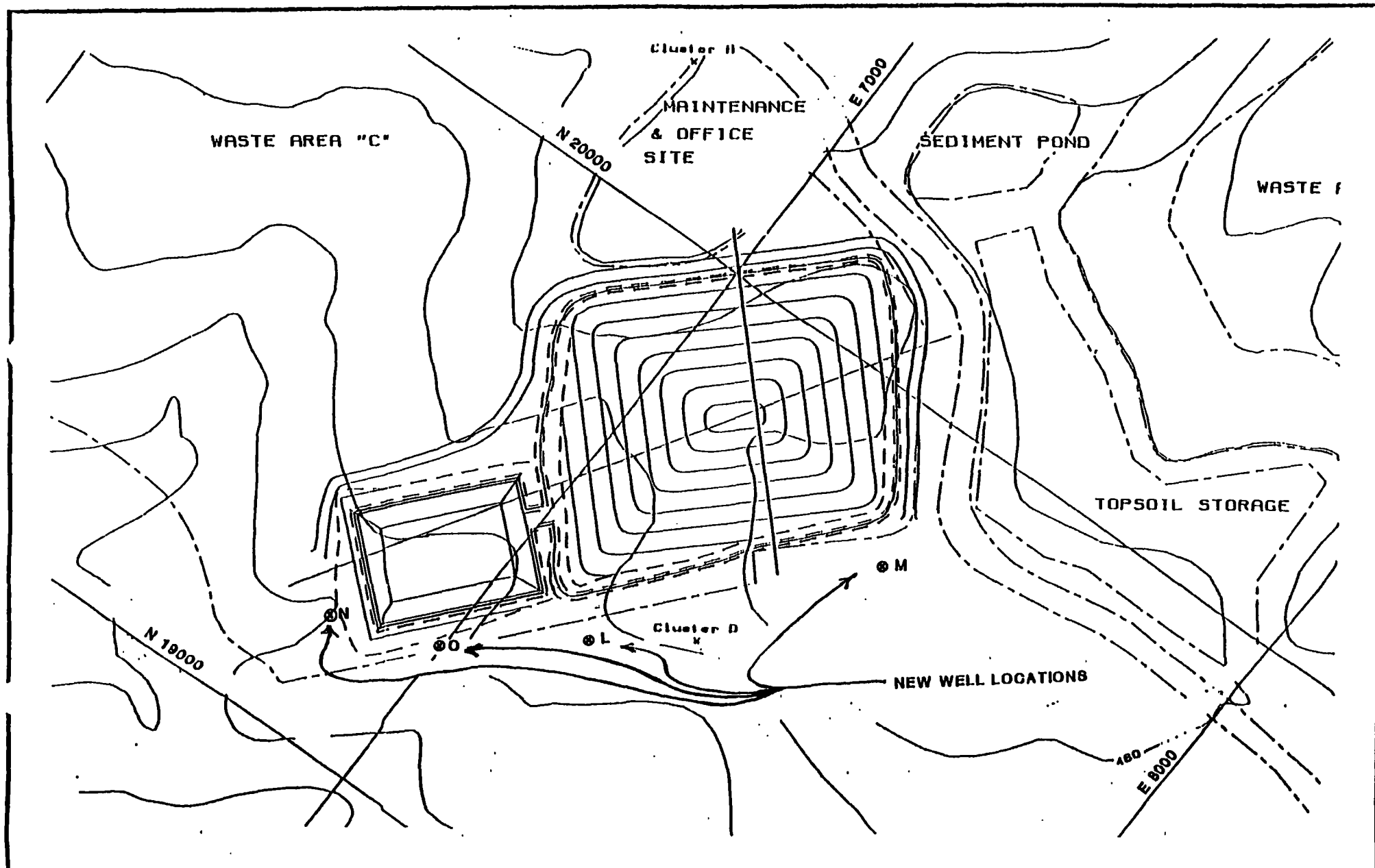
FIGURE 1

**BARITE HILL PROJECT  
McCORMICK, SC**

**SRK PROJECT NO. 14107**



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Consulting Engineers**



**BARITE HILL PROJECT  
McCORMICK, SC**

**SRK PROJECT NO. 14107**

**FIGURE - 2**

**MONITOR WELL LOCATIONS**



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Consulting Engineers

CLIENT Nevada Goldfields, Inc.  
PROJECT Barite Hill Landfill  
JOB No 14107  
DATE DRILLED January 7, 1992  
DRILLER ED&S (Bob)

BOREHOLE  
Well - L

INSPECTOR  
Grant

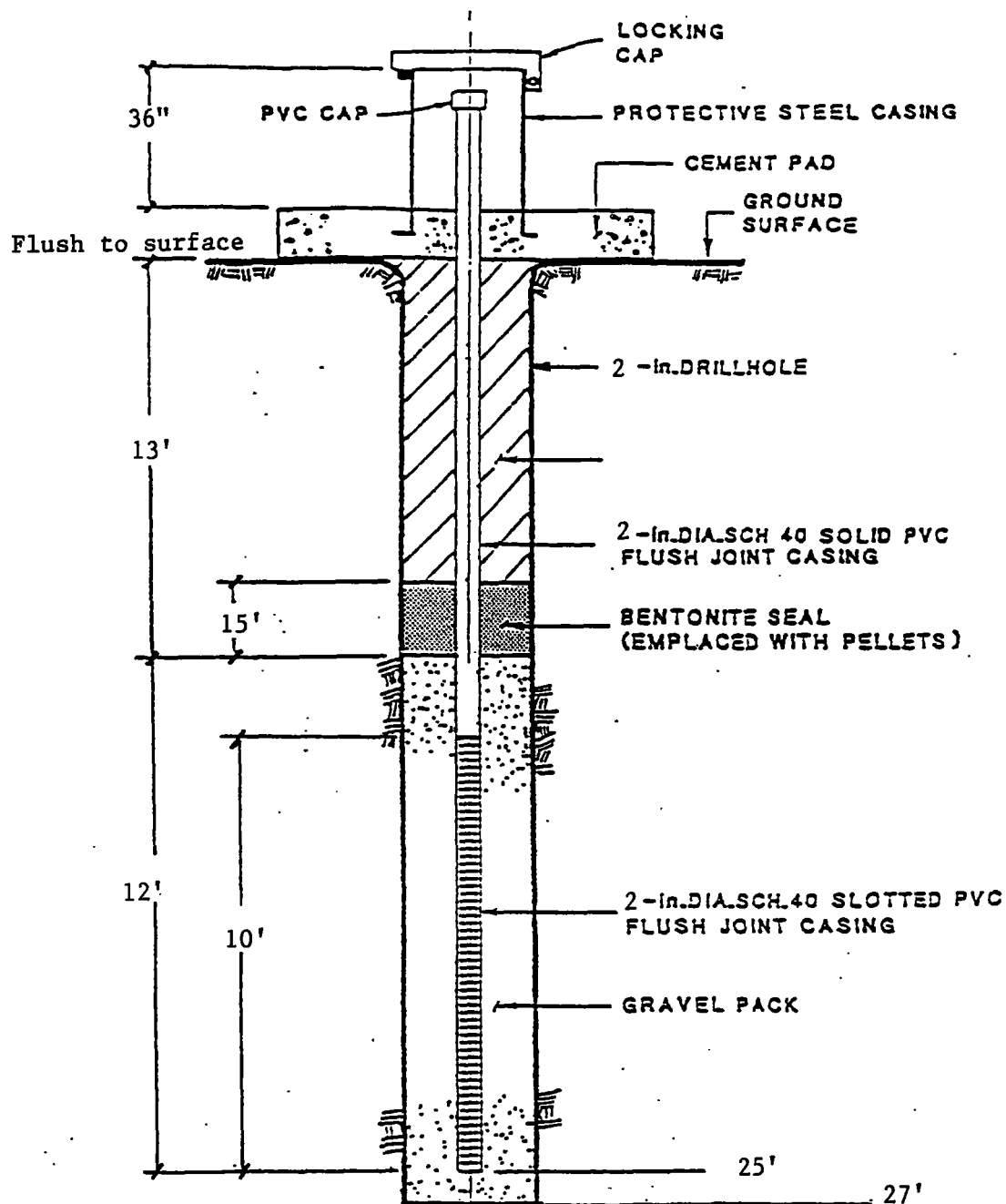
SHEET OF

LOCATION Barite Hill Landfill Project, McCormick, South Carolina

COORDINATES N/A

SURFACE ELEVATION

FEET (BLS)	DESCRIPTION	REMARKS
5	Red orange silty clay of saprolitic origin (fill)	
10	Yellow orange silty clay with rock fragments of a sericite schist.	
15		
20		
25		
30	Boring terminated at 27' No groundwater encountered at time of boring.	



# **MONITORING WELL**

(NOT TO SCALE)

PROJECT No.  
14107

DATE  
1/7/92

REVISION  
0



**STEFFEN ROBERTSON & KIRSTEN**  
Consulting Engineers

Nevada Goldfields Inc.

Battle Hill Landfill Project

**COMPLETION DIAGRAM FOR  
MONITORING WELL**

-L-



CLIENT Nevada Goldfields, Inc.  
PROJECT Barite Hill Landfill  
JOB NO 14107  
DATE DRILLED January 7, 1992  
DRILLER ED&S (Bob)

**BOREHOLE**  
Well - M  
**INSPECTOR**  
Grant

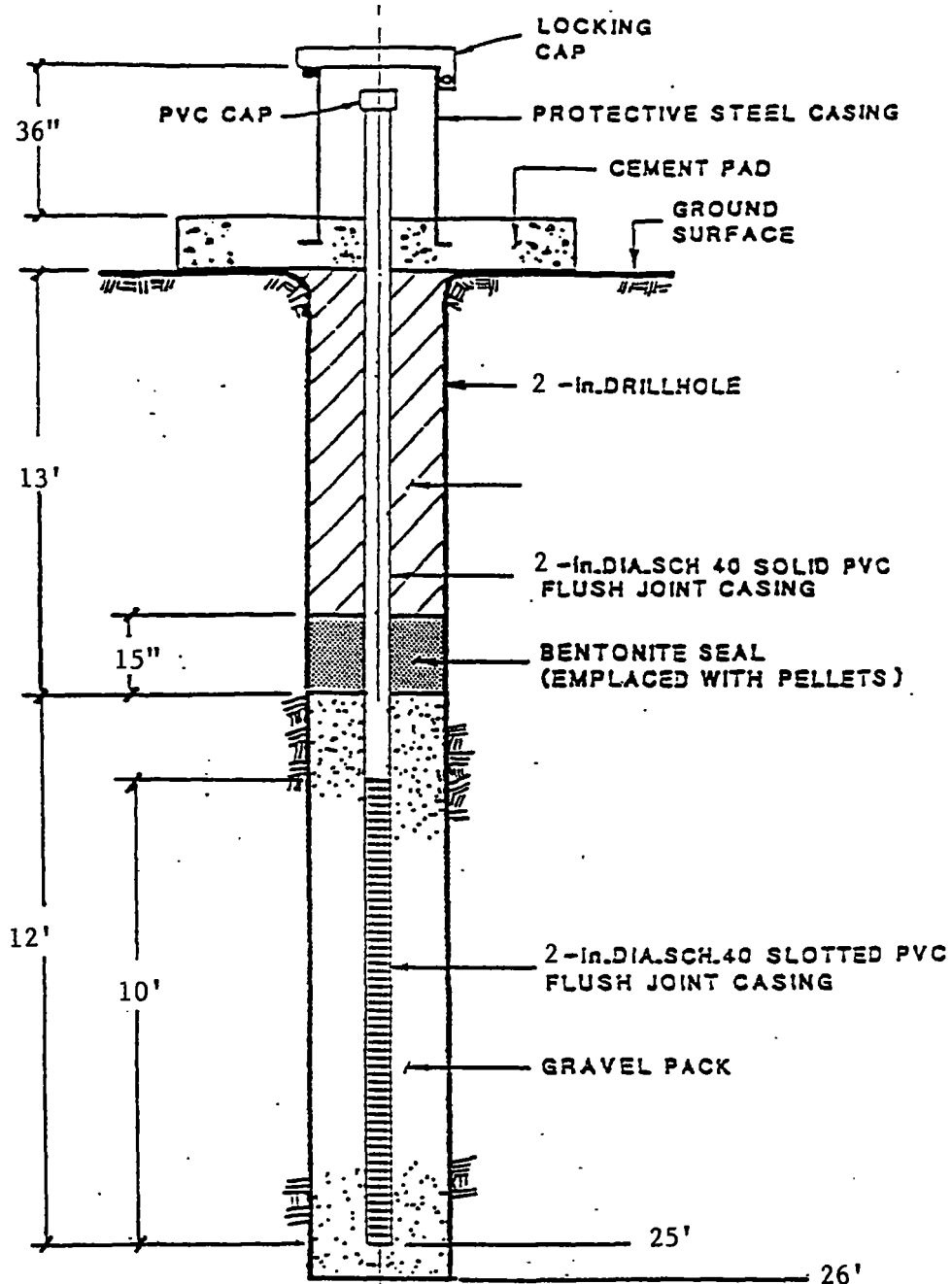
**SHEET 1 OF 1**

**LOCATION** Barite Hill Landfill Project, McCormick, South Carolina.

COORDINATES N/A

## SURFACE ELEVATION

FEET (BLS)	DESCRIPTION	REMARKS
5	Returns are red orange silty clay to sapro- lite origin.	
10	=====	
15	Returns are yellow green silt, no rock fragments apparent.	
20		
25	Boring terminated at 26'.	
30	No groundwater encountered at the time of boring.	



# MONITORING WELL

(NOT TO SCALE)

PROJECT No.

14107

DATE

1/7/92

REVISION

0



STEFFEN ROBERTSON & KIRSTEN  
Consulting Engineers

Nevada Goldfields Inc.

Battle Hill Landfill Project

COMPLETION DIAGRAM FOR  
MONITORING WELL

-M-



**BOREHOLE**  
Well - N  
**INSPECTOR**  
Grant

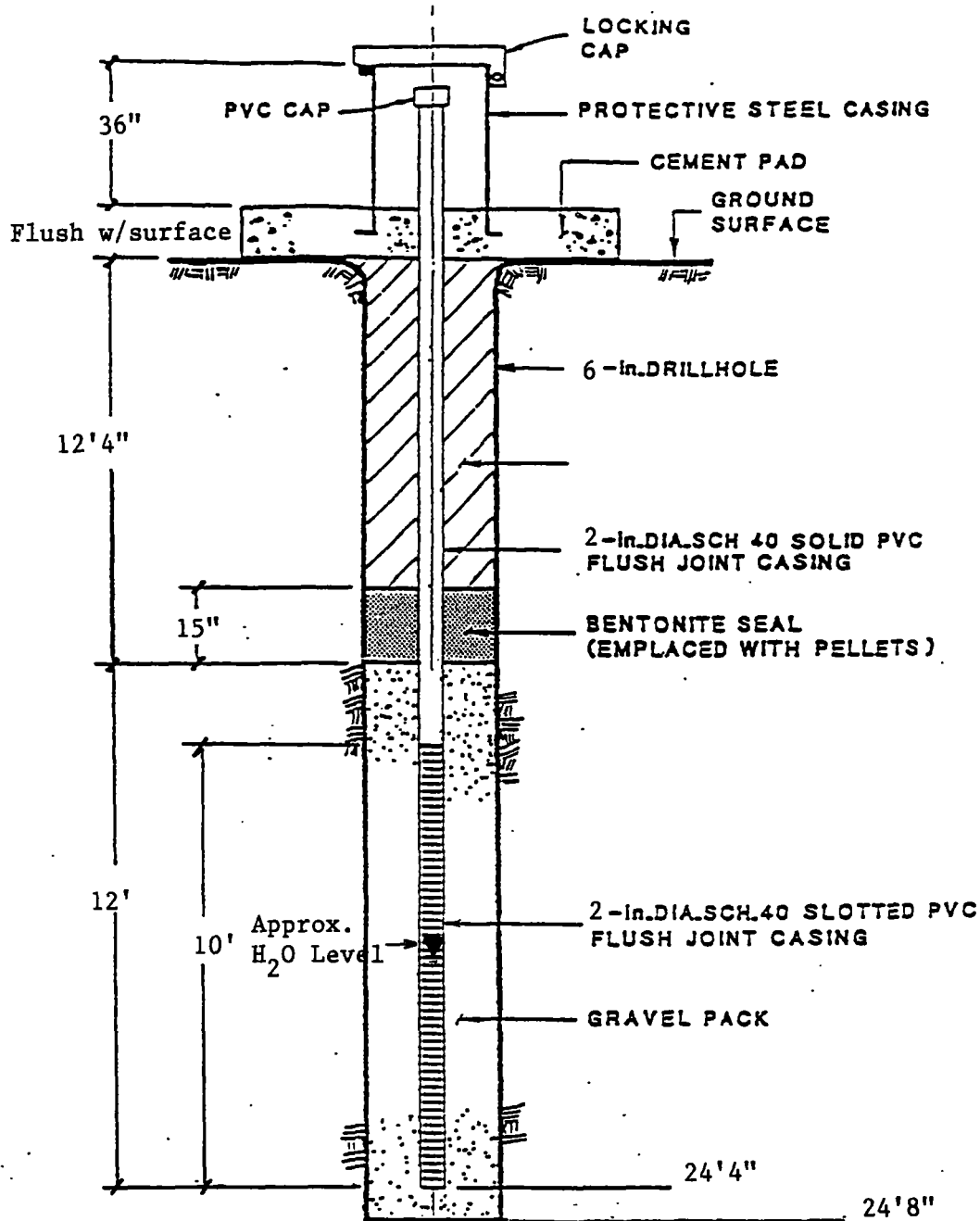
**SHEET 1 OF 1**

**LOCATION** Barite Hill Landfill Project, McCormick, South Carolina

COORDINATES N/A

## SURFACE ELEVATION

FEET (BLS)	DESCRIPTION	REMARKS
5	Grey orange silty clay with rock fragments of schist grading into a pale grey sericite schist.	
10		
15		
20		
25	Auger refusal on very competent rock, 24'8". Boring terminated.	
30	No groundwater encountered at time of boring.	



# **MONITORING WELL**

(NOT TO SCALE)

PROJECT No.	14107
DATE	1/7/92
REVISION	0



**STEFFEN ROBERTSON & KIRSTEN**  
Consulting Engineers

Nevada Goldfields Inc.  
Barite Hill Landfill Project

**COMPLETION DIAGRAM FOR  
MONITORING WELL**

-N-



**DRILLER** ED&S (Bob)

Grant

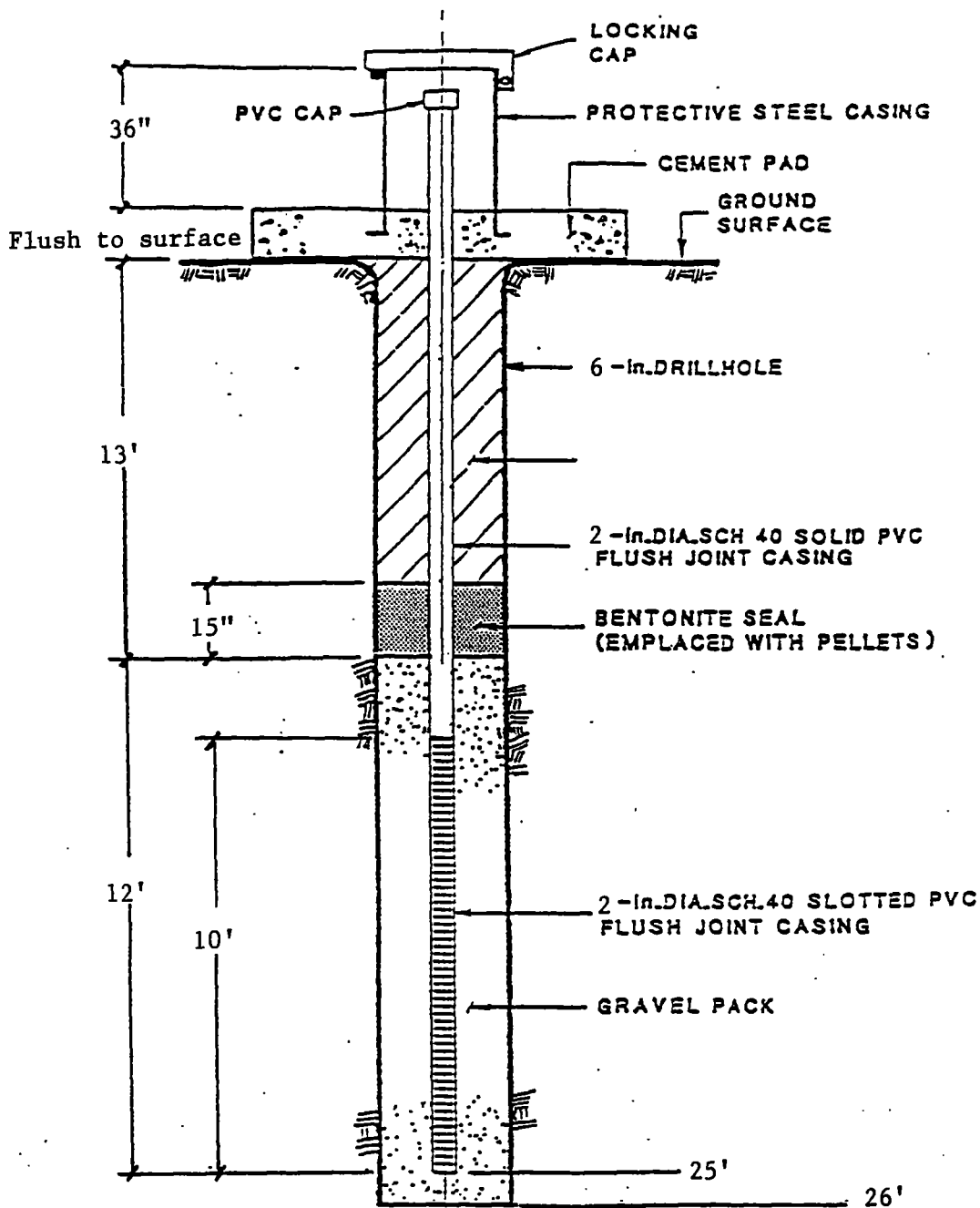
**SHEET 1 OF 1**

**LOCATION** Barite Hill Landfill Project, McCormick, South Carolina

**COORDINATES** N/A

## SURFACE ELEVATION

FEET (BLS)	DESCRIPTION	REMARKS
5	Yellow brown silty clay grading into a pale grey silt.	
10	(Silt is powdered returns of a sericite schist) with rock fragments of the same material.	
15		
20		
25	Boring terminated at 26'.	
30	No groundwater encountered at the time of boring.	



**MONITORING WELL**

(NOT TO SCALE)

PROJECT No.

14107

DATE

1/7/92

REVISION

0



**STEFFEN ROBERTSON & KIRSTEN**  
Consulting Engineers

Nevada Goldfields Inc.

Battle Hill Landfill Project

**COMPLETION DIAGRAM FOR  
MONITORING WELL**

-0-